REMARKS

Status of Claims

Claims 1-19 are present for examination.

Objections to Written Description:

Applicant has made changes to the written description by way of the attached mark-up copy of the substitute specification. A "clean" copy of the substitute specification is also provided for convenience of the office. In the substitute specification the Abstract has been revised in accordance with the examiner's suggestions as stated in paragraph 8 of the outstanding office action. Further the objections as stated in paragraph 9 of the office action have been corrected. Additional formal changes have been made throughout the written description. No new matter has been added.

Prior Art Rejections:

Claim 1 stands rejected under 35 U.S.C. 103 as unpatentable over Shiragaki in view of Manchester. Further, claims 2-19 stand rejected under 35 U.S.C. 103 as unpatentable over the combination of Shiragaki and Manchester.

The examiner's rejections are respectfully traversed.

The examiner recognizes that Shiragaki fails to disclose the scrambler and descrambler at each of the input and output interfaces respectively. Manchester is used to supply the missing ingredients.

However, the Manchester reference is discussed in applicant's written description as originally filed and is readily seen to be quite different from applicant's invention.

Manchester discloses a problem of IP over SONET system for transmitting IP packet being stored in a frame of SONET. SONET adopts frame synchronizing scramble using the polynomial $1 + X^6 + X^7$. Originally, SONET was designed on the assumption that a byte-multiplied signal would be transmitted. In a byte-multiplied signal, a bit string transmitted

from one client does not extend over continuous plural bytes. However, in the IP over SONET system, an IP packet is not byte-multiplied and stored in a frame of SONET.

For this reason, the situation arises where a bit string transmitted from one client extends over consecutive plural bytes in a SONET frame. If this bit string is identical to a bit string to be used in the scrambler, the bit string is scrambled such that it is converted into consecutive 0s. Continuation of the same codes over plural bytes interferes with the extraction of a clock in the optical receiver or causes a bit error. A third party who bears ill will may easily make such an attack on purpose.

The generator polynomial $1 + X^6 + X^7$ for forming a pseudo-random pattern is adopted in the SONET scrambler system and its length is 127 bits. Therefore, even if a client does not know a position of a SONET frame where an IP packet transmitted by the client is located, when a pseudo-random pattern where the generator polynomial is $1 + X^6 + X^7$ is continued to be transmitted using an IP packet, the pattern synchronizes with a scrambler of SONET with probability of 1/127, allowing the same code to be generated continuously.

As a means for solving such a problem, Manchester proposed a system which uses both the conventional SONET scramble and self-synchronizing scramble utilizing a pseudo-random pattern generated by the generator polynomial: $1 + X^{43}$. A length of a pseudo-random pattern generated by $1 + X^{43}$ is 8,796,093,022,207 ($= 2^{43}-1$) bits. A self-synchronizing scrambler is not reset in a specified position of a frame and performs scrambling continuously over plural frames. Descramblers require at least 43 bits for synchronization, but can maintain synchronization by performing descrambling continuously over plural frames when they once synchronized with each other similarly to the scrambler. In this system, the probability that a bit string transmitted from a third party synchronizes with two scramblers is 9×10^{-16}, and this is small enough to be ignored.

However, this system cannot be applied directly to an optical switching system. In a self-synchronizing scrambler, internal states of a scrambler and a descrambler, namely, the value of a bit string stored in a register varies with bit strings of the past. As mentioned before, in the optical switching system, a transmission source of a frame received by the

output interface varies every time when the optical switch performs switching. For this reason, synchronization between the scrambler and the descrambler is lost when switching is performed. Moreover, even if the frame synchronizing scrambler is used, in the case where the scrambler and the descrambler are not reset per frame but are operated continuously, it is not secured that the scramblers of all the input interfaces operate synchronously with each other. For this reason, the synchronization between the scrambler and descrambler is possibly lost each time when the optical switch performs switching.

This is a problem peculiar to a switching system, and this problem cannot be solved by synchronizing systems devised for a one-to-one transmission device including the above-mentioned system devised by Manchester et al.

Thus, the case of applying scramblers to an optical switch, the scramblers of all the input interfaces do not always operate synchronously with each other. Therefore, the synchronization of descramblers on output interfaces is possibly lost each time when the optical switch performs switching. The present invention can solve such a problem by the following means:

(1) Resetting the scramblers simultaneously; and resetting the descramblers simultaneously (claims 1-10, 16-18); or

(2) At each scrambler, attaching a scrambler internal state to a frame to be sent; and at each descrambler, receiving the internal state attached with a received frame into the descrambler, to establish the synchronization between the scrambler and the descrambler (claims 11-15, 19).

In the above means (1), the following systems are included:

1.1) sending a frame pulse to scrambler/descrambler (claims 1-6, 16-17), which is suitable for frame-sync type; and

1.2) sending a scrambler internal state to scrambler/descrambler (claims 7-10, 18), which is suitable for self-sync type.

The above means (2) is applicable to both frame-sync and self-sync types.

As discussed above, Manchester discuss only a point-to-point transmission system. Accordingly, Manchester does not have the above-described problem such that the scramblers of all the input interfaces do not always operate synchronously with each other and thereby the synchronization of descramblers on output interfaces is possibly lost each time when the optical switch performs switching. As the Examiner stated, it may be possible to reset scrambler/descrambler. However, Manchester is not predicted on a plurality of input interfaces. Therefore, Manchester is silent on the above means (1) and (2). This is a primary difference between the present invention and Manchester.

Conclusions:

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of

papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date Dec. 1, 2004 By _____

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